Track reconstruction efficiency

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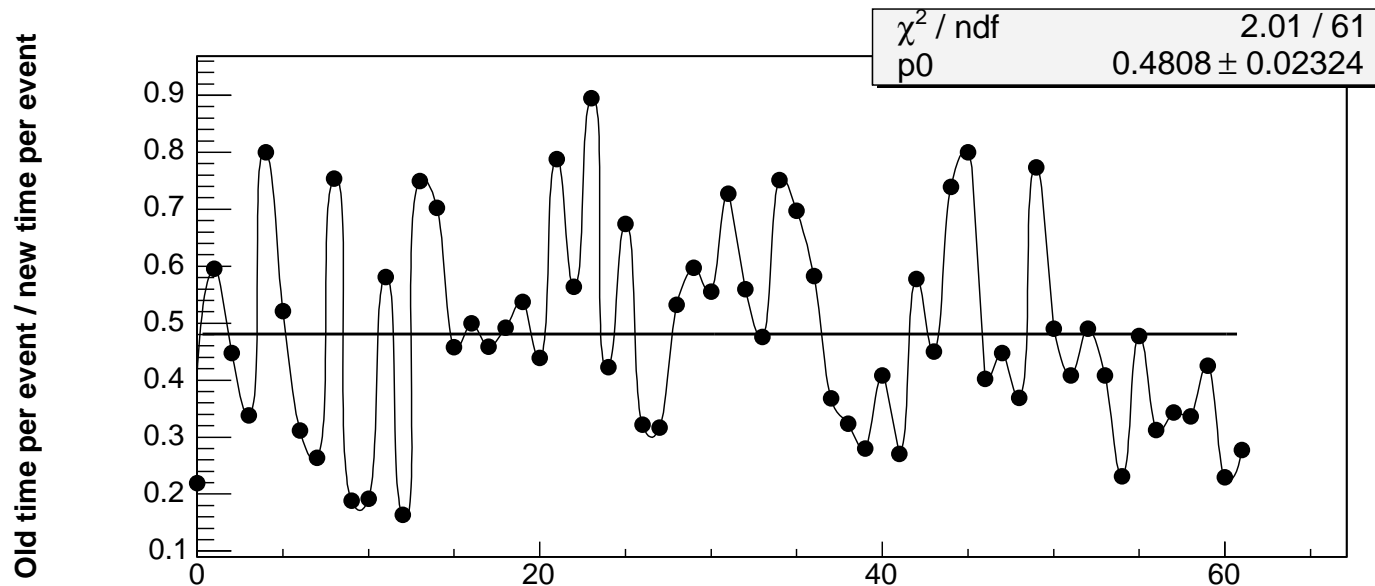
Tralgo Meeting

http://www-d0.fnal.gov/˜rakitin/d0_private/tex/2006.Sep.21.Tralgo/tr.pdf

Current tracking algorithm

- Current tracking algorithm requires either 3+ hits in SMT barrels or 3+ hits in SMT disks

- If we allow 3 hits anywhere in SMT:
  - tracking inefficiency diminishes by 18%
  - timing increases by factor of ~2 because of increased combinatorics

Changed tracking algorithm

- Idea:
  - Use standard tracking algorithm (stage I)
  - Then find clusters in EM calorimeter
  - Shoot imaginary tracks from PV to EM clusters with no matching tracks
  - Apply tracking algorithm to hits nearby these imaginary tracks (stage II)
  - Allow 3 hits anywhere in SMT at stage II only

- This must diminish the timing per event ⟵ **primary concern**
- Track validation in stage II is removed to decrease time

Data sample

I use relatively old $Z \rightarrow e^+ e^-$ data sample:

- One EM cluster in CC ("tag electron") – must have matching track
- Another EM cluster in end-caps ("probe electron") – does not have to have matching track
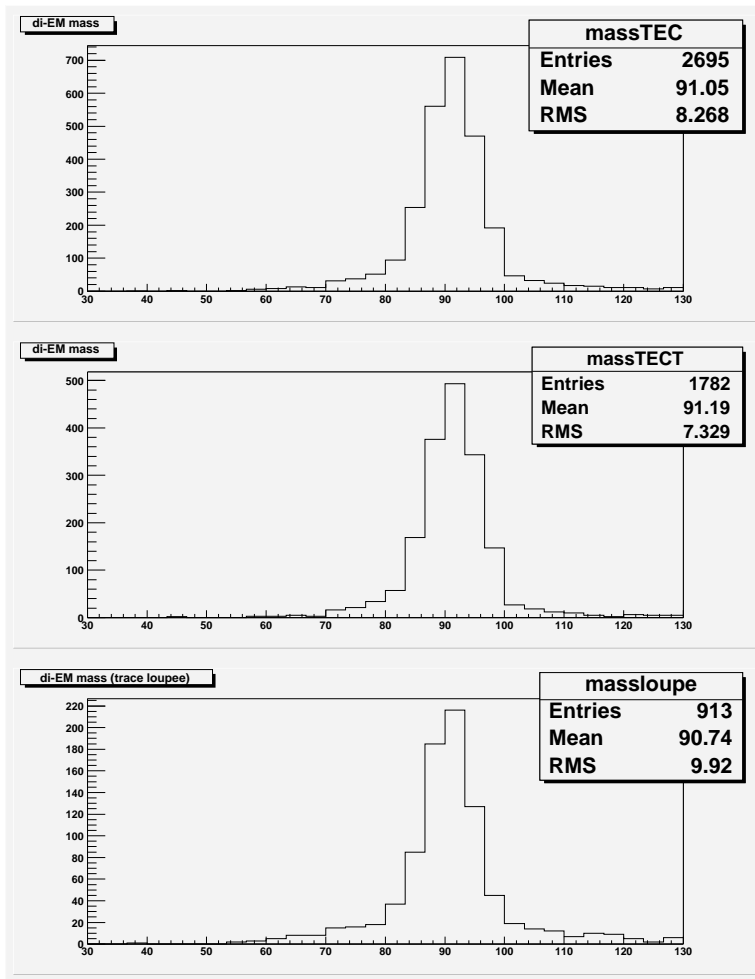
The plots of di-EM mass (© Jan Stark):

- Upper: all events
- Middle: probe electron has matching track (~66%)
- Lower: probe electron has no matching track (~34%)

- Matching track isn't reconstructed
  for probe electron in one-third of cases
- Perfect setup for studying forward tracking

In my study I only use events from the sample in the lower plot

Timing studies

Timing
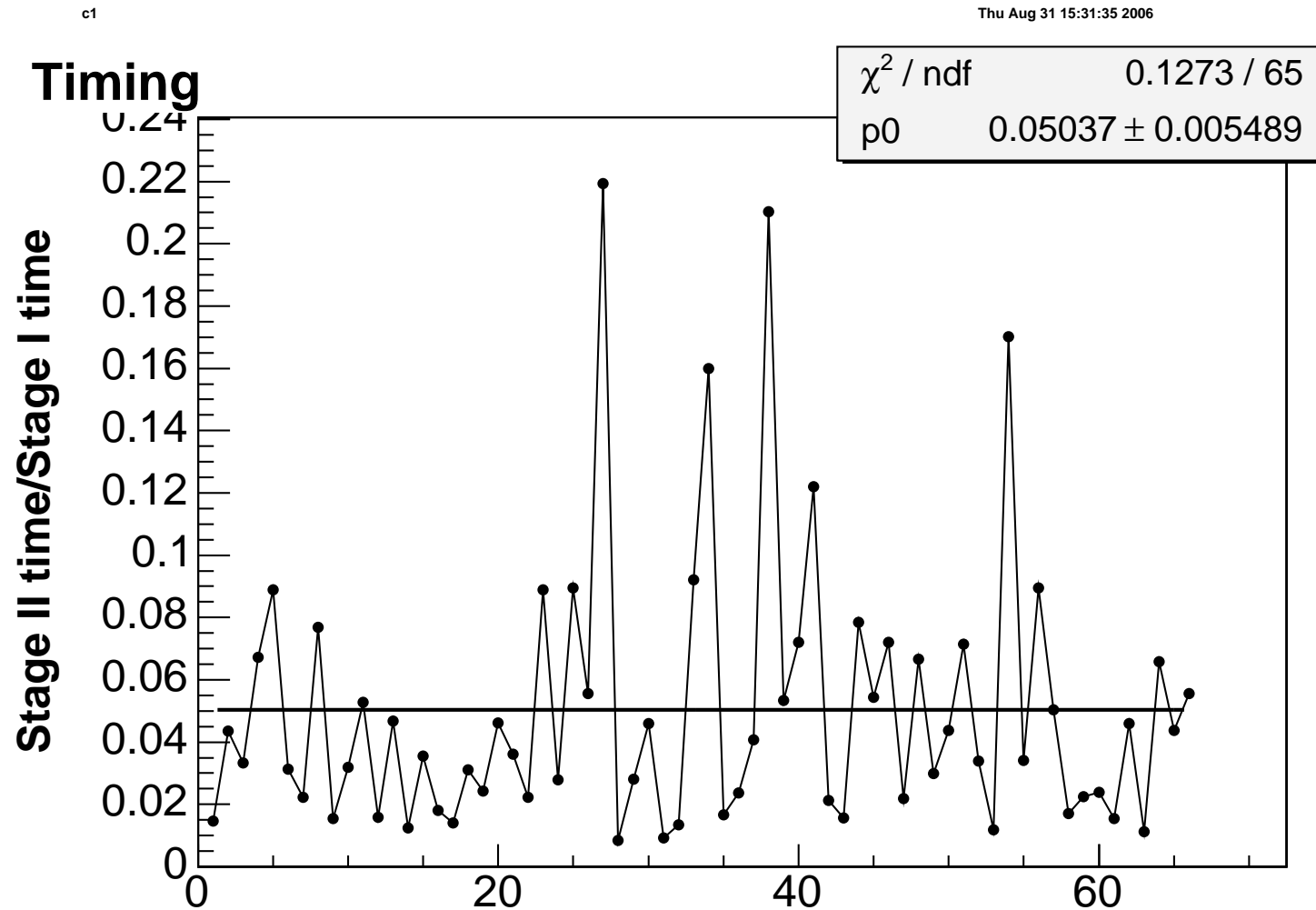
On average stage II time comprises ~5% of stage I time

Conclusion:

- Stage II tracking increases the tracking time by 5% as opposed to factor of ≈ 2

- Stage II tracking decreases inefficiency by 18% which means that the efficiency increases by $\approx 2\%$

- This change may be included in official d0reco package